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A MIOCENE CYPRESS SWAMP

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Bartram writing before the American Revolution has this to say of the cypress: "This Cypress is in the first order of North American trees. Its majestic stature is surprising. On approaching it we are struck with a kind of awe at beholding the stateliness of its trunk. . . . The delicacy of its color and the texture of its leaves exceed everything in vegetation. . . . Prodigious buttresses branch from the trunk on every side, each of which terminates underground in a very large, strong serpentine root, which strikes off and branches every way just under the surface of the earth, and from these roots grow woody cones, called Cypress knees, four, five and six feet high, and from six to eighteen inches and two feet in diameter at the base."

At the present time the bald cypress does not extend northward above latitude 39° which it almost reaches in both Delaware and Indiana. During the Pleistocene, however, following the final retreat of the ice it flourished considerably farther northward, buried cypress swamps of Pleistocene age being a feature of these and somewhat earlier deposits. They are exposed at innumerable points in our coastal plain from Maryland southward wherever the rivers have happened to cut into them, often exhibiting the remains of huge stumps with their wide-spreading roots and knees, the peaty matrix crowded with twigs, cone-scales, and seeds. It seems evident from this, and other evidence of a subfossil character, that at the present time the cypress is gradually becoming more restricted in its range. When we go back to

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* Dr. Gager's paper on Radioactivity and Life, which was to be a part of this number, will, unfortunately, have to be delayed.

the Tertiary period, however, a matter of a couple of million years or so, we find the cypress occupying a position to which its picturesque beauty entitles it, for its remains are found from Siberia and Spitzbergen across the arctic regions to Ellesmere Land, Greenland, and Alaska and southward over a large part of Asia, Europe, and America. Both Europe and Asia could claim it as a native plant up to the time the great glaciers came down from the north and forced it into the Mediterranean sea or against the fatal ice sheets that centered in the southern highlands of the Himalayas, Balkans, Alps, etc.

We in America have an almost unequalled series of early Tertiary deposits, but coming down to the latter half of that period we find our record much broken and scattered so that the botanist who would collect Miocene plants in any great variety must journey to Europe where there are innumerable localities of wide renown and great excellence.

Here in eastern North America our Miocene deposits are all marine and while they yield several hundred species of fossil shells often of exceeding great beauty, particularly in the Carolinas, they have only furnished thus far the scant remains of six species of fossil plants * preserved in a chance deposit in the District of Columbia.

Great interest therefore attaches to the recent discovery of indications of a cypress swamp along the ancient coastal estuaries of Virginia at a time when the diatomaceous deposits which now constitute the Calvert formation were being laid down off shore. During a recent visit to Richmond a considerable collection of fossil plants was made from these diatomaceous beds and a fair picture was obtained of some of the inhabitants of this far off cypress swamp.

First of all, the cypress twigs are preserved in greatest abundance, much broken to be sure, but indistinguishable as regards form and habit from their modern descendants. An occasional cone-scale was uncovered furnishing conclusive proof that we were not confusing cypress and sequoia, for a very abundant Tertiary

* An undescribed flora from southern New Jersey in the hands of Dr. Hollick may be of late Miocene age.

sequoia, *Sequoia Langsdorffii*, has twigs which greatly resemble those of the cypress. Then there were the seeds of the gum (*Nyssa*) showing that the tupelos were associated with the taxodiums even as far back as the Miocene. Along with the foregoing there was a species of willow (*Salix*) and one of water elm (*Planera*), another of water beech (*Carpinus*), an oak (*Quercus*) and an ash (*Fraxinus*), a fig (*Ficus*), and a button-ball (*Platanus*).

A large number of leaf fragments were unidentifiable as were also six or eight different varieties of seeds, but leaves of *Celastrus* were recognized as well as two kinds of leaflets of some members of the Leguminosae. Another genus which was recognized was *Salvinia*.*

It has always been a matter for wonderment that these great beds of diatoms could have been laid down and remain so free from land-derived sediments unless they were deposited in deep water far from any shore, which seemed improbable. The fossil plants just mentioned help us to a probable solution of this problem for they point unmistakably to the existence of cypress swamps and these in turn indicate that the land was low with sluggish and meandering streams so that the amount of sediment carried was reduced to a minimum or what was carried was entirely strained off, only the impalpably fine sediment which to-day makes the diatomaceous earth so argillaceous in places, succeeding in reaching the areas where the diatom skeletons were being deposited.

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* A complete account of this flora is in course of publication.